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Knowledge level and adoption pattern of maize production technology among farmers in upper reaches of Kashmir region

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Abstract
The present study was conducted in Baramulla and Kupwara districts of Kashmir to the assess the knowledge level of farmers and adoption of recommended agricultural practices in maize. Maize is widely cultivated in Jammu and Kashmir, being grown in the Kandi, Karewa, and plain areas. The results showed that majority of respondents had knowledge about recommended number of ploughings during land preparations, 60.7 percent of the respondents who had knowledge about recommended varieties of maize of their belt. While as, majority 69.34 percent had no knowledge about MOP fertilizer application, followed by 76.0 percent of the respondents had no knowledge about recommended chemicals for seed treatment. Also, it was observed that 72 percent of the respondents had medium level of adoption, 52 percent had low level of adoption and 26 percent of the respondents had high level of adoption of recommended package of practice.

Keywords: Adoption pattern, maize production technology, farmers

Introduction
Agriculture has been a mainstay livelihood by providing stable sources of food to mankind, but dealing with nature and manipulating it according to human needs is difficult. Since agriculture is affected by natural calamities and other problems. In this situation advisory on these problems comes in handy. Dissemination of information on modern technologies among farmers is as important the development of technologies in research centres. Farmers need information not only on farming (e.g., new seeds, fertilizers, pesticides, equipments) but also for selling output at right place and remunerative price, demand patterns, government schemes, weather information, and so on.

There are considerable knowledge gaps between researchers, extension agents, and farmers. Farmers' experience or indigenous knowledge (IK) is accumulated over generations. Scientists' technical knowledge is synthesized from years of research. These two systems of knowledge should be integrated for the benefit of both and to enhance mutual learning to reduce knowledge gaps between farmers and researchers. The technology delivery system should be re-oriented to handle changing circumstances and to deliver complex, knowledge-intensive technologies to farmers. Knowledge is an important factor in determining the adoption of improved crop management practices and increased yields. Transfer of knowledge intensive technologies has to receive priority. The bridging of knowledge gaps can bridge yield gaps. New paradigms need to be added to transfer and use newer quality seed and knowledge based technologies under new policy environments.

Available information about the new technology influences its adoption. It enables farmers to know much about its existence as well as the effective use of technology and this facilitates its adoption. Farmers will only adopt the technology they are aware of or have heard about it. It is therefore important to ensure that information is reliable, consistent, and accurate. Farmers need to know the existence of technology, its beneficial, and its usage for them to adopt it. Technology adoption among farmers is higher when extension services are made available. Through extension services, farmers get to know the benefits of new technology through extension agents. Extension agent acts as a link between the innovators (Researchers) of the technology and users of that technology. This helps to reduce transaction cost incurred when passing the information on the new technology to a large heterogeneous population of farmers (Genius, Koundouri, Nauges, & Tzouvelekas, 2013) [2].

Maize is widely cultivated in Jammu and Kashmir, being grown in the Kandi, Karewa, and plain areas. It thrives well in the sandy loam to loamy soils (Naikoo *et al*. 2022, Bashir *et al*., 2021, Bangroo *et al.* 2020) [3-4]. Varieties of maize have also been developed which perform well in the colder hilly and mountainous areas. Maize is the staple food of Gujjars and Bakarwals, living in the Kandi and hilly areas. Moreover, the grains form an important cattle feed, being fed to farm cattle and horses. The consequent growth in meat and poultry consumption has resulted in a rapid increase in the demand for maize as livestock feed. Also the different parts of the plant and the grain are put to a number of industrial uses. Maize is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions of Kashmir it is cultivated over an area of 70.85 thousand hectares with a production of 1008.71 thousand quintals. (Anonymous, 2017). Shere Kashmir University of Agricultural Sciences and Technology of Kashmir has developed few promising varieties which have gained popularity among farmers. It is also evident that though the large diversity in agro climatic conditions of the state is conducive for propagation of diversified farming system, the terrain at the same time is tough and accessibility to a greater part of the region is poor. This causes the lot of hurdles to the inhabitants regarding the knowledge and awareness about the use of inputs, products and other farming practices. However if the farmers adopt recommended cultivation practices and have appropriate knowledge about cultivation practices, there will be increase in production as well as productivity of maize in the state. Looking to above facts, present study is undertaken to study the knowledge and adoption level of maize growers of the recommended package of practices.

Methodology

Selection of the districts, blocks, village clusters and sample respondents

Based on maximum area under maize, two districts *viz*. Baramulla with an area of 20.04 thousand ha and a production of 288.42 thousand quintals and district Kupwara with an area of 18.46 thousand ha and a production of 211.71 thousand quintals respectively were selected purposively (Anonymous, 2017). Hence the study was carried in two districts.

Development of interview schedule

The data was collected with help of a well-structured Interview Schedule developed for the purpose. The Interview Schedule was developed for gathering of information on knowledge and adoption of the respondents identified. The construction of interview schedule was done strictly in accordance with already planned objectives. The Interview Schedule was pretested over a sample of 30 farmers.

The data was collected in 2017. The researcher personally administered the interview schedule to respondents. The respondent were contacted personally so as to achieve the objectives accurately and to extract reliable information in order to arrive at valid generalizations. The significance of study was explained to respondents personally. Queries made and objections raised by respondents were replied to their satisfaction so as to obtain objective response.

Knowledge level

After the finalization of the knowledge tests items selected were formulated into questions. The answers to each question were divided into three categories, 'full', 'partial' and 'no' knowledge elicited from the farmers were quantified by giving scores of 2,1 and 0 to full, partial and no response respectively. Based on the response obtained, the knowledge level was quantified by using frequency and percentages. The knowledge of the recommended crop production technology was calculated by means of knowledge index formula.

$$\text{Knowledge index} = \frac{\text{Respondents total score}}{\text{Total possible score}} \times 100$$

Finally respondents were divided into three categories using mean and standard deviation N = 300

S. No.	Category	
1.	Low	Low (<Mean - SD)
2.	Medium	Medium (Between Mean ± SD)
3.	High	High (> Mean + SD)

Adoption

It is the decision of making full use of new ideas as the best course of action available. The term adoption in this study was used to denote the use of recommended package of practice of maize by the respondents.

To measure the extent of adoption the recommendations were divided into three categories; Fully adopted, Partially adopted and Not adopted and were quantified by giving scores to each *viz*., '2' score to full adoption, '1' score to partial adoption and '0'score to no adoption. Therefore maximum score obtainable was 30 in maize for each respondent. Based on the responses the adoption level was quantified by using frequency and percentage. Adoption of recommended crop production technology was measured by means of adoption index formula.

$$\text{Adoption index} = \frac{\text{Respondents total score}}{\text{Total possible score}} \times 100$$

Finally respondents were divided into three categories using mean and standard deviation.

S. No.	1`Category	
1.	Low	Low (<Mean - SD)
2.	Medium	Medium (Between Mean ± SD)
3.	High	High (> Mean + SD)

Statistical analysis of the data

The raw data was transformed on master sheet and as per the objectives of the study data was analysed using SPSS applying appropriate statistical procedures to draw the meaningful inferences. The correlation coefficient of knowledge and adoption (Dependent variables) was calculated using Pearsons' coefficient of correlation. The formula was used as follows:

$$r = \frac{N\Sigma\Sigma x - \Sigma x \Sigma y}{\sqrt{N\Sigma x^2 - (\Sigma x)^2 . N\Sigma Y^2 - (\Sigma y)^2}}$$

Where,
r = Correlation coefficient
x = Score of independent variable
y = Score of dependent variable
N = Number of observation

Result and Discussion

Knowledge of maize growers regarding individual recommended cultivation practices

The extent of application scientific recommendations was low due to the disadvantages as its complexity leading to difficulty to be applied by farmers. Table gives the insight of individual about cultivation practices of maize. According to the table, majority of respondents had knowledge about recommended number of ploughings during land preparations, 60.7 percent of the respondents who had knowledge about recommended varieties of maize of their belt. While as, majority 69.34 percent had no knowledge about MOP fertilizer application, followed by 76.0 percent of the respondents had no knowledge about recommended chemicals for seed treatment. Not all farmers adopt recommended fertilizer and pesticide application because this comprised of many measures that required highly producing knowledge farmers to follow. Some of farmers only followed some components reducing seed rate and nitrogen fertilizer only. For effective management of disease and insect pest there is need of collective effort of the farming community. The pesticide use is an integration of different methods including proper dosage and timing. Seed treatments are essential prophylactic measures to mitigate disease and insect pest, but due to lack of knowledge among the farmers these treatments had negligible adoption among farmers.

Knowledge of maize growers regarding individual recommended cultivation practices

N = 150

S. No	Statements		Full		Partial		No	
			Frequency	Percent	Frequency	Percent	Frequency	Percent
1	Name the recommended variety of maize.		91	60.70	0	0.00	59	39.30
2	How many ploughings are recommended during land preparation?		149	99.30	1	0.70	0	0.00
3	What are the recommended chemicals for seed treatment?		0	0.00	36	24.00	114	76.00
4	What is the recommended seed rate?		90	60.00	60	40.00	0	0.00
5	What is recommended rate of fertilizers?	Urea	26	17.33	124	82.67	0	0.00
		DAP	32	21.34	60	40.00	58	38.67
		MOP	31	20.67	15	10.00	104	69.34
		1st split (urea)	26	17.34	0	0.00	0	0.00
		2nd split (urea)	20	13.34	0	0.00	0	0.00
6	What is the recommended split dose of N fertilizer?		77	51.30	42	28.00	31	20.70
7	What are the proper crop stages for weeding?		0	0.00	114	76.00	36	24.00

The knowledge scores were calculated and 48 percent of the respondents had low level of knowledge, 34.6 percent had medium level of knowledge and only 17.3 percent of the respondents had high level of knowledge.

Level of respondent's knowledge on maize cultivation

(N = 150)

Levels of knowledge	Percentage (%)
Low (<Mean - SD)	48.00
Medium (Between Mean ± SD)	34.60
High (> Mean + SD)	17.30

Mean = 17.44, S.D = 6.04

It was observed that 72 percent of the respondents had medium level of adoption, 52 percent had low level of adoption and 26 percent of the respondents had high level of adoption index.

Table 1: Level of respondent's adoption on maize cultivation

(N = 150)

Levels of adoption	Details of respondents (%)
Low (<Mean - SD)	52.00
Medium (Between Mean ± SD)	72.00
High (> Mean + SD)	26.00

Mean = 13.01, S.D = 5.13

Correlation refers to the degree to which knowledge and adoption of recommended package of practices are related. Correlations are useful because they can indicate a predictive relationship that can be exploited in practice. A Pearson's correlation coefficient of 0.94 indicates a suggests a strong, positive association between two variables.

Correlation refers to the degree to which knowledge and adoption of recommended package of practices are related.

Correlations			
		Knowledge	Adoption
Knowledge	Pearson Correlation	1	.940**
	Sig. (2-tailed)		.000
	N	150	150
Adoption	Pearson Correlation	.940**	1
	Sig. (2-tailed)	.000	
	N	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

Conclusion

To increase the adoption efforts to improve their knowledge about the benefit and economic efficiency of technology is imperative. Thus, mass media should reach all farmers, especially in the remote areas. Enhancing capacity on the extension and management of the extension staff, increasing fund for extension activities, and merging the small farms are needed for wider adoption. Also, emphasis should be directed towards endeavouring to attend extension programmes for sensitization regarding the benefits of adopting improvement technologies. Through attendance of extension programmes, information about agricultural modernization can be disseminated away farmers efficiently. There is need for farmers to adopt disease control measures in order to realize

quality and quantity output.

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